WE CLAIM:

1. A concurrent, dual-band receiver that receives a signal at two desired frequency bands, simultaneously, comprising:

(a) a concurrent, dual-band, front-end subsystem; and

(b) a concurrent, dual-band, image-rejection, frequency downconverter.

2. The receiver of claim 1, wherein

the front-end subsystem outputs an RF signal and has in its transfer function relative signal attenuation regions at frequency bands outside the two desired frequency bands, and

the downconverter includes

(i) a first image-rejection downconversion stage that receives the RF signal from the front end subsystem and that is adapted to simultaneously downconvert the RF signal at two desired bands to two intermediate frequency (IF) bands such that the image frequency bands of the two desired frequency bands fall at the attenuation regions of the front-end transfer function; and

(ii) a subsequent image rejection downconversion stage that downconverts the two IF bands.

3. The receiver of claim 2, wherein the subsequent image rejection downconversion signal downconverts the two IF bands to baseband or near baseband signals.

4. The receiver of claim 1, wherein the front-end subsystem includes

(i) a concurrent, dual-band antenna;

(ii) a concurrent, dual-band bandpass filter connected to the antenna and that receives the dual-band signal from the antenna; and

(iii) a concurrent, dual-band LNA connected to the filter that provides simultaneous gain and impedance matching at the multiple bands while maintaining a low noise figure.

5. A concurrent, dual-band, image-rejection downconverter for a concurrent dual-band RF receiver having a front-end subsystem that supplies a front-

end signal having two discrete desired frequency bands and a transfer function with attentuation regions at frequency bands outside the two discrete desired frequency bands, comprising:

(a) a first image-rejection downconversion stage that receives and that is adapted to simultaneously downconvert the front-end signal to two intermediate frequency (IF) bands such that the image frequency bands of the two desired frequency bands fall at the attenuation regions of the front-end transfer function; and

(b) a subsequent image-rejection downconversion stage that downconverts the two IF bands.

6. The downconverter of claim 5, wherein the first downconversion stage includes:

(i) a first quadrature local oscillator (LO_1) block adapted to supply an in-phase (I) signal and a quadrature (Q) signal of a first predetermined frequency;

(ii) a first mixer connected to the LO_1 block and the front-end subsystem that is adapted to mix the in-phase LO_1 signal with the front-end signal and to supply a resultant in-phase intermediate frequency (IF) signal; and

(iii) a second mixer connected to the LO_1 block and the front-end subsystem and adapted to mix the quadrature LO_1 signal with the front-end signal and to supply a resultant quadrature IF signal,

wherein the first predetermined frequency of the LO_1 block is offset from the midpoint of the two desired bands such that the image frequency bands of the two desired bands fall at attenuation regions of the front-end transfer function.

7. The downconverter of claim 6, further including an in-phase IF filtering and amplification stage connected to the first mixer and a quadrature IF filtering and amplification stage connected to the second mixer.

8. The downconverter of claim 5, wherein the subsequent downconversion stage includes

(i) a second quadrature local oscillator (LO_2) block adapted produce an in-phase (I) signal and a quadrature (Q) signal at a second given frequency;

(ii) a first intermediate frequency (IF) mixing stage connected to the LO_2 block and the first mixer that is adapted to mix the in-phase intermediate frequency (IF) signal with the in-phase signal of the LO_2 block and to supply a resultant first low frequency (LF) signal;

(iii) a second IF mixing stage connected to the LO_2 block and the second mixer that is adapted to mix the quadrature signal of the LO_2 block with the quadrature IF signal and to supply a resultant second LF signal;

(iv) a third quadrature local oscillator (LO_3) block adapted produce an in-phase (I) signal and a quadrature (Q) signal at a third given frequency;

(v) a third IF mixing stage connected to the LO_3 block and the first mixer that is adapted to mix the in-phase LO_3 signal with the in-phase IF signal and to supply a resultant third LF signal; and

(vi) a fourth IF mixing stage connected to the LO_3 block and the second mixer that is adapted to mix the quadrature LO_3 signal with the quadrature IF signal and to supply a resultant fourth LF signal.

9. The downconverter of claim 8, further including

a first summing circuit that combines the first and second LF signals (to constructively add the first desired baseband signal and destructively combine the baseband image signal associated with the first desired baseband signal); and

a second summing circuit that combines the third and fourth LF signals (to constructively add the second desired baseband signal and destructively combine the baseband image signal associated with the second desired baseband signal).

10. The downconverter of claim 8, wherein

the first IF mixing stage includes a first IF mixer,

the second IF mixing stage includes a second IF mixer

the third IF mixing stage includes a third IF mixer

the fourth IF mixing stage includes a fourth IF mixer.

11. The downconverter of claim 8, wherein

the first IF mixing stage includes a first IF mixer that mixes the in-phase IF signal with in-phase LO_2 signal, and a fifth IF mixer that mixes the in-phase IF signal with quadrature LO_2 signal;

the second IF mixing stage includes a second mixer that mixes the quadrature IF signal with the quadrature LO_2 signal and a sixth IF mixer that mixes the quadrature IF signal with the in-phase LO_2 signal;

the third IF mixing stage includes a third mixer that mixes the in-phase IF signal with the in-phase LO_3 signal and a seventh mixer that mixes the in-phase IF signal with the quadrature LO_3 signal; and

the fourth IF mixing stage includes a fourth mixer that mixes the quadrature IF signal with the quadrature LO_3 signal and an eighth mixer that mixes the quadrature IF signal with the in-phase LO_3 signal.

12. The downconverter of claim 11, further including

a first summing circuit that sums the outputs of the first and second mixers;

a second summer that sums the outputs of the fifth and sixth mixers;

a third summing circuit that sums the outputs of the third and fourth mixers; and

a fourth summing circuit that sums the outputs of the seventh and eighth mixers.

13. The downconverter of claim 5, wherein the first downconversion stage includes:

(i) a front-end signal phase shifter connected to the front-end subsystem that provides a quadrature front-end signal along a quadrature front-end signal path;

(ii) a first local oscillator (LO_1) block adapted to supply an in-phase (I) signal of a first predetermined frequency;

(iii) a first mixer connected to the LO_1 block and the front-end subsystem that is adapted to mix the LO_1 signal with the front-end signal and to supply a resultant in-phase intermediate frequency (IF) signal; and

(iv) a second mixer connected to the LO_1 block and the front-end phase-shifter and adapted to mix the LO_1 signal with the quadrature front-end signal and to supply a resultant quadrature IF signal,

wherein the first predetermined frequency of the LO_1 block is offset from the midpoint of the two desired bands such that the image frequency bands of the two desired bands fall at attenuation regions of the front-end transfer function.

14. A method of concurrently dowconvertering a dual-band RF signal, comprising:

(a) providing a dual-band RF signal having a front-end transfer function having two desired frequency bands and attenuation notches at non-selected frequency bands; and

(b) downconverting the RF signal such that the image frequencies of the two-bands fall at the attenuation notches of the front end transfer function.

15. The method of claim 14, wherein the downconverting step includes

splitting the RF signal to first and second signal processing paths;

mixing the RF signal on the first path with an in-phase first local oscillator (LO_1) signal to produce an in-phase intermediate frequency (IF) signal;

filtering the in-phase IF signal;

mixing the RF signal on the second path with a quadrature LO_1 signal to produce a quadrature IF signal;

filtering the quadrature IF signal;

mixing the filtered in-phase IF signal with an in-phase second local oscillator (LO_2) signal;

mixing the filtered quadrature IF signal with the a quadrature LO_2 signal;

mixing the filtered in-phase IF signal with an in-phase LO_3 signal;

mixing the filtered quadrature IF signal with the quadrature LO_3 signal;

adding the mixed in-phase LO_2 signal to the quadrature LO_2 signal; and

subtracting the mixed in-phase LO_3 signal from the mixed quadrature LO_3 signal.